

**Fact Sheet:
Potential Contribution of NGVs
to Displacing 35 Billion Gallons of
Non-Petroleum Fuels by 2017**

KEY FINDINGS

- Trucks and buses are the backbone of America's commercial transportation system and the lifeblood of the nation's economic health.
- Commercial vehicles are the primary on-road consumers of diesel fuel, the use of which the Energy Information Agency (EIA) forecasts will reach over 50 billion gallons per year by 2017.
- Ethanol is not expected to be able to displace any of this diesel fuel, and biodiesel will be able to displace at most 2 billion gallons per year.
- Depending on the level of government support, use of domestic natural gas to power the nation's trucks and buses could displace 3, 5, 7 or over 10 billion gallons per year by 2017.
- If properly supported, renewable biomethane could provide virtually all of this 10 billion gasoline-gallon-equivalent of gas.

INTRODUCTION

- In his 2007 State of the Union address, President Bush called for the use of 35 billion gallons of renewable and alternative fuels in the place of petroleum in America's transportation sector by 2017.
- While a significant portion of this target can most likely be met with agricultural-based fuels, other alternative fuels will have to play a role if the 35 billion level is to be achieved. Based on credible analyses, it is not realistic – or even possible – to achieve 35 billion gallons of renewable and alternative fuel use solely with ethanol and biodiesel.
- While there has been some effort to use ethanol as a substitute for diesel fuel, it is expected that ethanol will be used almost exclusively as a gasoline substitute.
- Biodiesel can be used when blended in low percentages with petroleum diesel. However, because of engine and production limitations, it is expected that biodiesel could displace not more than 2 billion gallons of petroleum diesel by 2017.
- America's economy is dependent on our commercial fleets, and those fleets are currently dependent on the availability of affordable diesel fuel.
- Fortunately, there is an affordable and available diesel substitute for America's medium- and heavy-duty fleets, namely, natural gas.
- Today in the U.S., NGVs is displacing the equivalent of 200 million gallons of petroleum – the majority of which is consumed in high fuel use urban fleet

vehicles. These include transit and school buses, trash trucks, urban delivery vehicles as well as shuttle, port and airport vehicles.

- **With the proper government support, by 2017, this could grow to 10 billion gallons per year, which is almost one-third of the President's goal.**
- While significant, this amount of fuel would represent only 6 percent of the natural gas used in America last year.
- If properly supported, virtually all of this additional natural gas demand – almost 10 billion gasoline-gallon-equivalent or 1.25 quadrillion Btu -- could be produced domestically from biomethane sources. Biomethane is pipeline quality gas produced from the decomposition of organic materials (such as in landfills, and from animal waste, sewage, crop waste, and cellulosic and non-cellulosic crops).

NGVS – A HERE-AND-NOW TECHNOLOGY

- NGVs – with performance as good as or better than comparable gasoline or diesel vehicles -- are commercially available and in use today. In fact, NGVs are one of the fastest growing alternatives to gasoline and diesel vehicles in the world.
- There are over 5 million NGVs on the road worldwide. Every continent (except Antarctica) is seeing substantial NGV expansion. Argentina is the world's leader with over 1.5 million NGVs (20 percent of all Argentine vehicles). Brazil, which is known as the world's ethanol leader, has over 1 million NGVs on its roads. Pakistan has over 1 million. China, India, Iran, and Germany are just a few other fast growing NGV markets.
- In the U.S., the primary NGV strategy has been to pursue the high fuel use, urban fleet market – e.g., transit and school buses, trash trucks, urban delivery vehicles, port and airport vehicles and taxis.
- While these vehicles make up a small percentage of the vehicles on the road, they use a disproportionately large amount of petroleum.
- According to the U.S. Energy Information Administration, the U.S. has only about 120,000 NGVs on the road. However, those vehicles consumed about 200 million gasoline-gallon-equivalents (GGE) in 2006. That is an average of over 1,500 GGE per vehicle. The average personal car in the U.S. uses only about 600 gallons of fuel. The applications targeted for natural gas use are more effective in replacing petroleum.

NGV'S POTENTIAL FOR THE FUTURE

- Vehicular natural gas use is growing in the U.S. The U.S. Energy Information Agency (EIA) forecasts that, in a “business-as-usual” scenario, natural gas use in vehicles will double by 2017.
- But, depending on the level of policy and other support from federal, state and local governments, growth could be substantially greater – to 3, 5 7 or even 10 billion gallons per year. The table below illustrates a scenario of how that could be achieved*:

Diesel Vehicles*	Mrkt. Share	Vehs. (000)	GGEs (MM)	Mrkt. Share	Vehs. (000)	GGEs (MM)	Mrkt. Share	Vehs. (000)	GGEs (MM)	Mrkt. Share	Vehs. (000)	GGEs (MM)
Freight Trucks	5%	589	2,273	10%	1,154	4,457	14%	1,616	6,239	20%	2,308	8,913
Light-duty Trucks	0%	0	0	0%	0	0	0%	0	0	0%	0	0
Trash Truck	10%	21	197	20%	42	386	25%	52	483	30%	63	579
Transit Buses	40%	38	319	50%	47	398	60%	57	477	70%	66	557
Intercity Buses	0%	0	0	0%	0	0	0%	0	0	0%	0	0
School Buses	20%	160	216	25%	200	270	30%	240	324	40%	320	432
		808	3,005		1,443	5,511		1,964	7,524		2,756	10,482

* Data based on EIA Annual Energy Outlook 2006

- Note that the number of diesel fueled vehicles that must switch to natural gas in order to achieve these scenarios is modest – ranging from just 808,000 for 3 billion gallon of displacement to 2,756,000 for the 10 billion gallon displacement.

NATURAL GAS SUPPLY

- When such a scenario is put forward, the first question that is frequently asked is “Could America’s natural gas supply support this growth in NGV use?” The answer is ... yes – *easily*.
- First, the 10 billion-plus gasoline-gallon-equivalent shown in the scenario above would represent only 6.2 percent of the natural gas consumed in the U.S. in 2006. Using EIA’s forecast, it would represent only 5.2 percent of the natural gas consumed in the U.S. in 2017.
- Second, discoveries of natural gas on- and off-shore in the lower-48 states continue to keep pace with consumption.

* Note that this analysis only focuses on displacing diesel fuel in on-road medium- and heavy-duty applications. NGV use is also growing in light-duty applications that displace gasoline. These applications include taxis, light-duty shuttles, police cars and commuter vehicles – as well as off-road applications such as forklifts.

- Third, there are huge untapped sources of natural gas on- and off-shore in the lower-48 states in areas that currently have been put “off-limits” to exploration and production by Congress. Given the need to move more aggressively to domestic energy sources, it is hoped that these restrictions will be removed in the near future.
- Fourth, there is a huge potential for biomethane – or renewable “natural gas.”
 - Biogas is a mixture of methane and other gases produced from the decomposition of organic materials.
 - Biogas is produced naturally in landfills, and from the processing of animal waste, sewage, crop waste, and cellulosic and non-cellulosic crops.
 - Biomethane is a pipeline-quality natural gas-substitute produced by purifying biogas.
 - Landfills, animal waste “lagoons,” and sewage processing plants are major sources of biogas, a major component of which is methane.
 - A U.S. Department of Energy study concluded that a feasible biomethane potential from these sources is 10 billion gasoline-gallon-equivalent per year.
- Finally, in the longer term, there is the potential of methane hydrates.
 - Methane hydrates are ice formations consisting of methane and water.
 - They can be found in Arctic areas and in the ocean floor at water depths greater than 1,000 feet.
 - Methane hydrates are found throughout the world – including off all U.S. coasts.
 - The U.S. Geological Survey conservatively estimates that energy contained in the world’s methane hydrates is twice the energy contained in all known fossil fuels on earth, i.e., twice that in all the world’s estimated natural gas, petroleum and coal *combined*.
 - Research is being carried out today to determine how to produce methane from hydrates economically. Officials in Japan, for example, have indicated that that country plans to have the technology needed to turn methane hydrates into commercial gas by 2016.

GREENHOUSE GAS AND OTHER ENVIRONMENTAL BENEFITS

- Natural gas vehicles are known for producing far less urban pollutants than comparable gasoline and diesel engines. What is less well known is that NGVs also produce less greenhouse gases.
- Natural gas has the highest hydrogen-to-carbon ratio of any fuel -- short of hydrogen itself.

- National and international studies have concluded that, on a full cycle, well-to-wheels basis, NGVs produce about 15 percent less greenhouse gases than a comparable diesel vehicles, and 20 percent less than comparable gasoline vehicles.
 - This includes the greenhouse gas impact of any methane (which is the primary component of natural gas) that may escape into the atmosphere during production transportation and use.
- Therefore, displacing the 10 billion gallons of petroleum in the scenario above would reduce greenhouse gases by the equivalent of over 15 billion tons of carbon dioxide per year.
- If 10 billion gallons was all displaced by biomethane, it is estimated that this would reduce greenhouse gases by the equivalent of *500 million metric tons of CO₂ per year* – or removing the emissions equivalent to *90 million light-duty gasoline vehicles off the road*.

THE ROLE OF THE FEDERAL GOVERNMENT

- As a result of market forces, the use of natural gas to power vehicles has been growing steadily in the U.S. over the past two decades.
- Incentives provided by the federal government – as well as some state and local governments – have helped further shift the economics of vehicle purchase and use to NGVs.
- For environmental, energy security, greenhouse gas and other reasons, other national governments have implemented policies that have significantly shifted the economics in favor of NGVs. As a result, these countries (e.g., Argentina) have realized substantial growth in the use of natural gas in vehicles.
- As shown above, growth in NGV use in the U.S. too could accelerate substantially *if* the federal government were to implement policies and programs to encourage significantly that growth. These include:
 - Extending and expanding federal financial incentives for the purchase and use of NGVs, and for the construction of NGV fueling stations, and
 - Raising the priority of NGVs in the programs of federal agencies including DOE, EPA and FTA, among others.